Circle Coordinate Geometry

1.

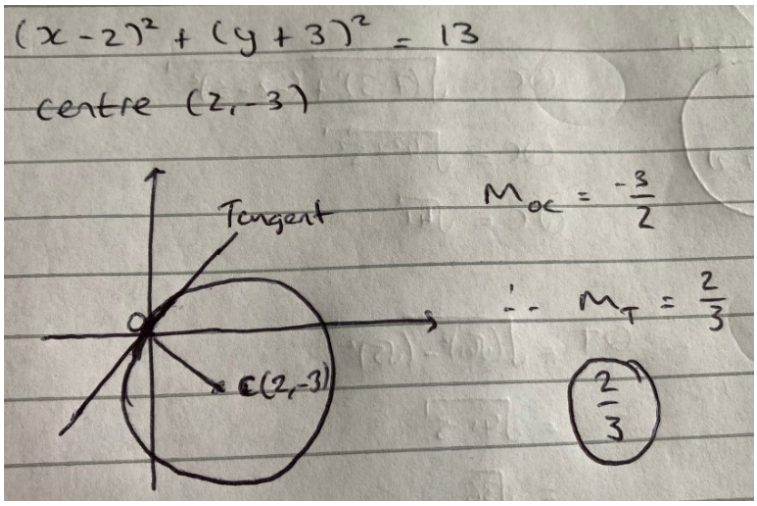
A circle has equation $(x-2)^2+(y+3)^2=13$

Find the gradient of the tangent to this circle at the origin.

Circle your answer.

[1 mark]

$-\frac{3}{2}$ $-\frac{2}{3}$ $\frac{2}{3}$ $\frac{3}{2}$



2.

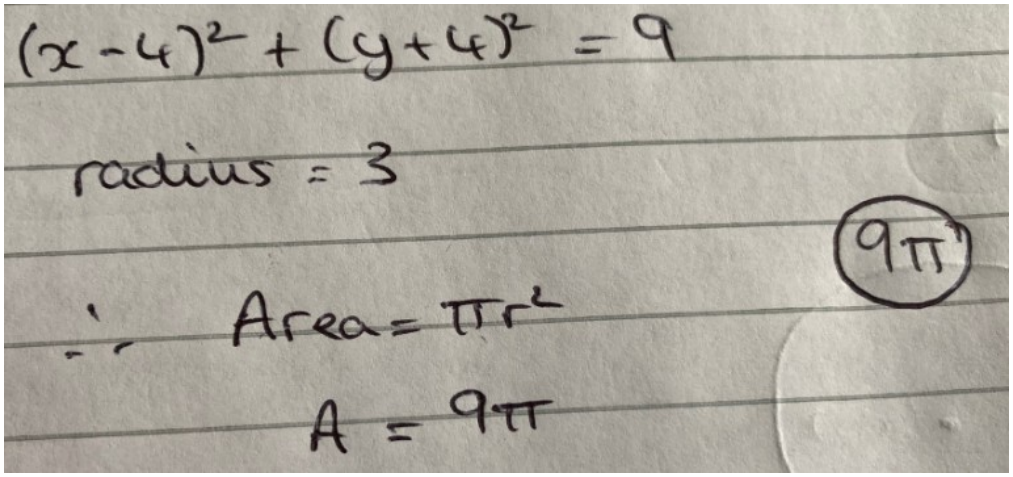
A circle has equation $(x-4)^2+(y+4)^2=9$

What is the area of the circle?

Circle your answer.

[1 mark]

3π 9π 16π 81π



3.

The circle with equation $(x-7)^2+(y+2)^2=5$ has centre C.

(a) (i) Write down the radius of the circle.

[1 mark]

(a) (ii) Write down the coordinates of C.

[1 mark]

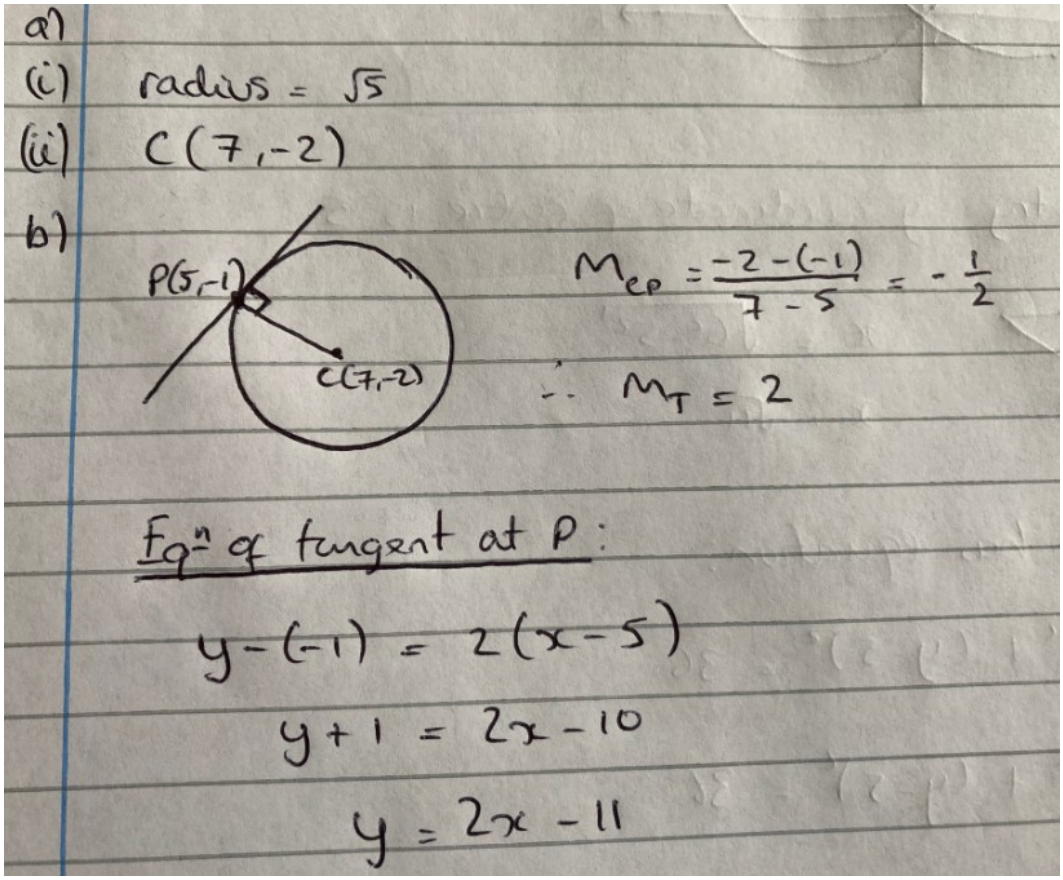
(b) The point P (5, –1) lies on the circle.

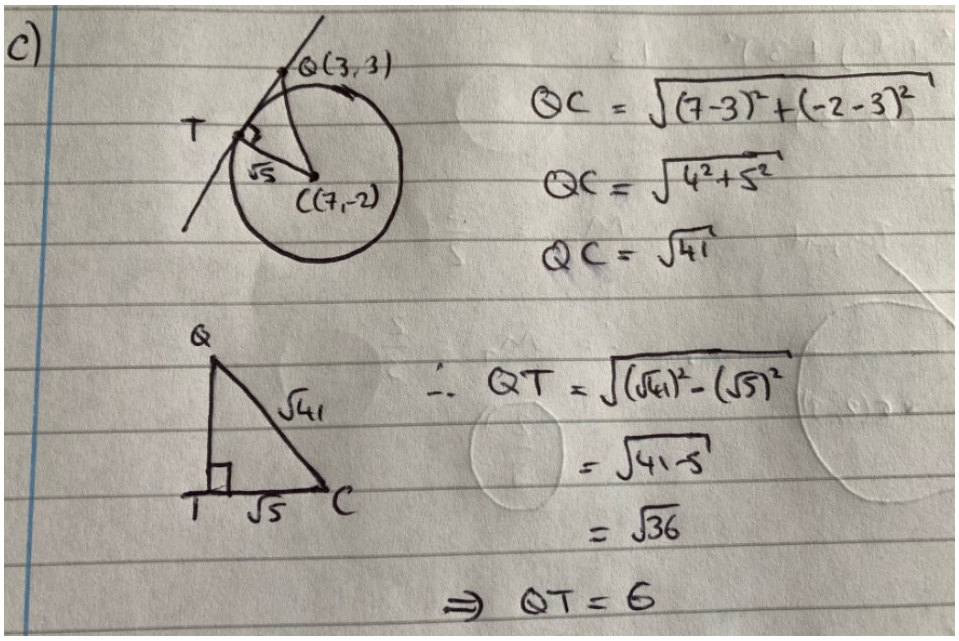
Find the equation of the tangent to the circle at P, giving your answer in the form $y=mx+c$

[4 marks]

(c) The point Q (3, 3) lies outside the circle and the point T lies on the circle such that QT is a tangent to the circle. Find the length of QT.

[4 marks]

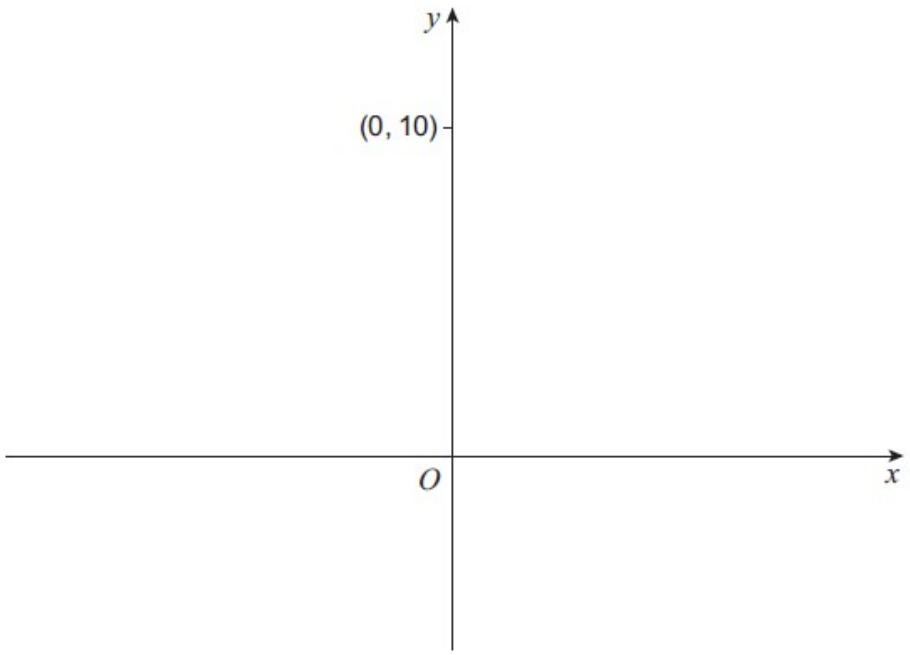




4. A circle of radius 6 passes through the points (0, 0) and (0, 10).

(a) Sketch the two possible positions of the circle.

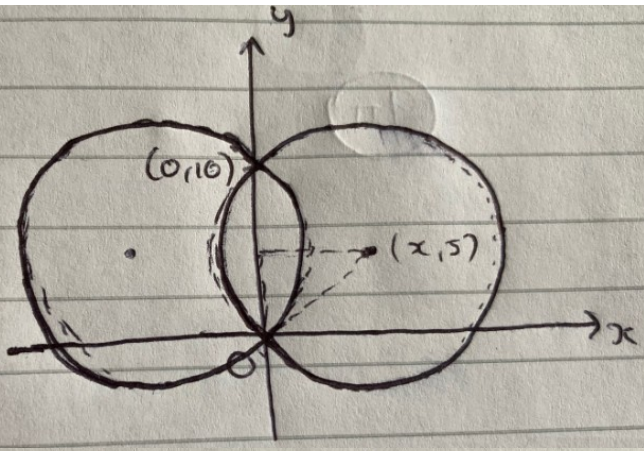
[1 mark]



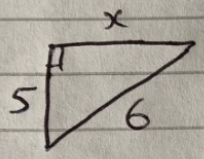
(b) Find the equations of the two circles.

[3 marks]

a)



b) By symmetry, y-coordinate of centre is 5



$x = \sqrt{6^2 - 5^2}$

$x = \sqrt{11}$

∴ Circle has equation:

$(x - \sqrt{11})^2 + (y-5)^2 = 36$

or $(x + \sqrt{11})^2 + (y-5)^2 = 36$

5.

A circle with centre C has equation $x^2 + y^2 + 8x - 12y = 12$

(a) Find the coordinates of C and the radius of the circle.

[3 marks]

(b) The points P and Q lie on the circle.
The origin is the midpoint of the chord PQ.
Show that PQ has length $n\sqrt{3}$, where n is an integer.

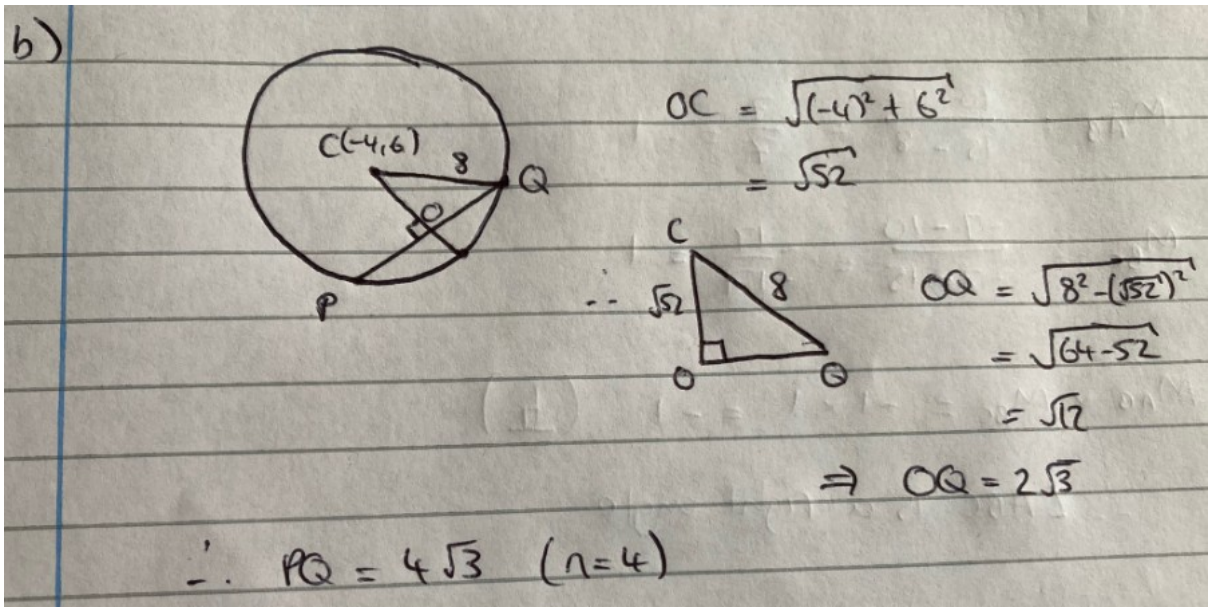
[5 marks]

a) $x^2 + 8x + y^2 - 12y = 12$

$(x+4)^2 - 16 + (y-6)^2 - 36 = 12$

$(x+4)^2 + (y-6)^2 = 64$

$C(-4,6)$ and radius $= 8$



6.

Circle C_1 has equation $x^2 + y^2 - 8x - 14y = -40$

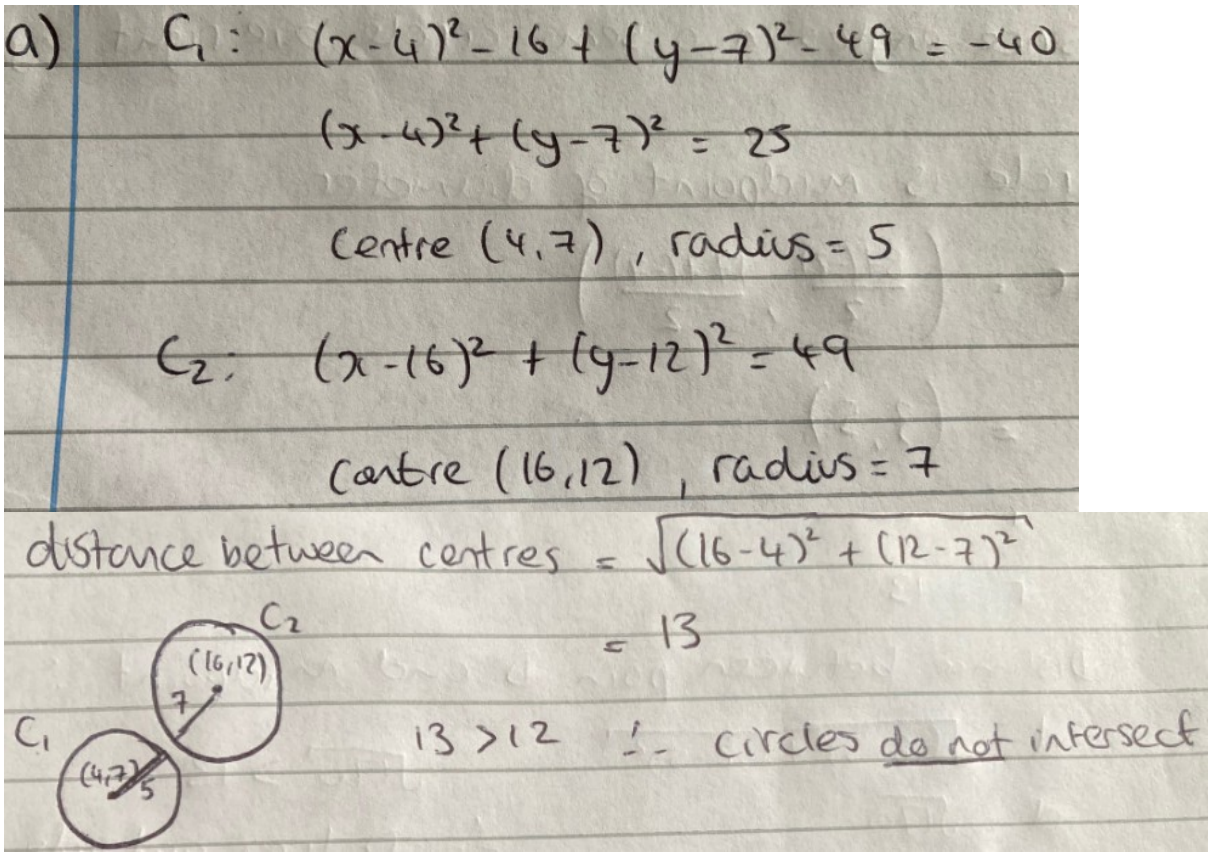
Circle C_2 has equation $(x - 16)^2 + (y - 12)^2 = 49$

(a) Determine whether C_1 and C_2 intersect.

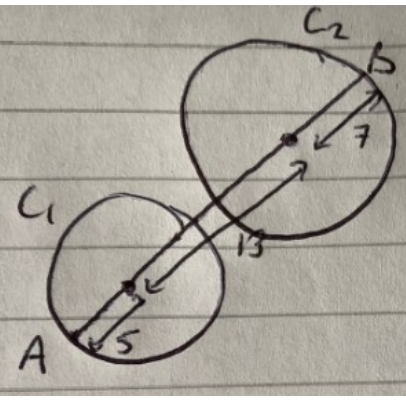
[7 marks]

(b) Find the maximum distance between a point on C_1 and a point on C_2.

[2 marks]



b)



Max distance between point on C_1 and C_2 is

$AB = 25$

7.

Three points *A*, *B* and *C* have coordinates *A* (8, 17), *B* (15, 10) and *C* (−2, −7)

(a) Show that angle *ABC* is a right angle.

[3 marks]

(b) *A*, *B* and *C* lie on a circle.

(b) (i) Explain why *AC* is a diameter of the circle.

[1 mark]

(b) (ii) Determine whether the point *D* (−8, −2) lies inside the circle, on the circle or outside the circle.

Fully justify your answer.

[4 marks]

a)

$$M_{AB} = \frac{10-17}{15-8} = \frac{-7}{7} = -1$$

$$M_{BC} = \frac{-7-10}{-2-15} = \frac{-17}{-17} = 1$$

$$M_{AB} \times M_{BC} = -1 \times 1 = -1 \quad (\perp)$$

$\therefore \angle ABC$ is a right angle

b)

(i) Since ABC is a right angle AC must be the diameter since angles in a semi-circle are right angles

(ii) Centre of circle is midpoint of diameter

Midpoint AC $= \left(\frac{8+(-2)}{2}, \frac{17+(-7)}{2}\right)$

$= (3, 5)$

radius is distance between point A and midpoint:

$r = \sqrt{(8-3)^2 + (17-5)^2}$

$r = \sqrt{5^2 + 12^2}$

$r = 13$

Distance between point D and midpoint:

$d = \sqrt{(-8-3)^2 + (-2-5)^2}$

$d = \sqrt{170}$

$\sqrt{170} > 13$

$\therefore$ D lies outside circle!